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DEVICE FOR CALIBRATION OF ACOUSTIC LOGGING EQUIPMENT [USTROYSTVO DLYA ETALONIROVANIYA APPARATURY AKUSTICHESKOGO KAROTAZHA]

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DEVICE FOR CALIBRATION OF ACOUSTIC LOGGING EQUIPMENT

The invention pertains to the technology of geophysical study of boreholes.

There is a known device for calibration of acoustic logging equipment, which consists of a hollow tube made of a material with a specific acoustic characteristic, filled with a fluid, which has the same acoustic impedance as the fluid that fills the borehole being tested. The hollow tube is equipped with a unit that is a hopper for storing the aforementioned fluid, which during calibration fills the space between the borehole instrument and the internal surface of the tube, while the tube is secured immovably on the frame of the borehole instrument throughout the entire process of equipment calibration [1].

However, immovably attachment of the calibration tube on the frame of the borehole instrument limits the possibilities of using the existing device, during calibration of acoustic logging equipment with reflected waves for example.

There is also an existing device for calibration of reflected wave acoustic logging equipment, which contains an external tube with component that is intended for attachment of the borehole instrument, in which a calibration cylinder with

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[1] Numbers in the margin indicate pagination in the foreign text.

defects inscribed on it is installed in the tube, and the cylinder is connected to the guide funnel, which transitions into a rod, and the tube has a guide with a lock pin on the end into which the rod passes. During calibration the lock pin is moved aside, and the calibration cylinder is ejected down, crossing in front of the acoustic system, which scans the cylinder. As a result a recording of an image of defects is made, which are inscribed on the cylinder, from which one can determined the resolving capacity of the equipment in the azimuthal and vertical planes.

However, this device can be used only with subsurface devices in which the acoustic system is located in the lower end of the instrument. At the present time there are only a few prototypes of equipment with such positioning of the acoustic system available in the country. But currently equipment with an acoustic system positioned in the center of the subsurface instrument is being prepared for serial production. The use of the device for calibration of such equipment makes it cumbersome and in practice not really applicable. Moreover, the movement speed of the calibration cylinder in the existing device is not regulated, but the possibility of its regulation would be quite useful for selecting the optimal speed of borehole investigation.

The goal of the invention is expansion of the functional capabilities of the device.

For this purpose the frame and cylinder are each made of two lengthwise interlinking parts, each part of the frame has a groove and is equipped with a packing gland, and the cylinder is connected to the controllable brake mechanism, while the parts of the cylinder are made of materials with different acoustic impedance.

The drawing presents the configuration of the device, which is depicted in the process of calibration prior to measurements in the borehole.

The device for calibrating acoustic logging equipment contains frame 1, which consists of two tightly sealed interlinking parts, rubber gaskets 2, the calibration cylinder 3 with defects inscribed on it that consists of two interlinking parts, which are made of materials with different predetermined acoustic impedance, plunger 4, which enters cylinder 5 with valve 6 and lever 7, which is connected by means of threading to plunger 4. The external tube has a fill opening, covered by plug 8. The calibration device is secured to the borehole instrument 9, which has an acoustic scanning radiator 10.

The device works in the following manner.

The borehole instrument 9 is suspended from a logging cable (not shown). The calibration device is located opposite the output opening of the acoustic system. The half-cylinders of cylinder 3 are interlinked, then the half-cylinders of frame 1.

The cavity of frame 1 is filled with borehole mud through the fill opening. The acoustic radiator 10 scans the calibration cylinder 3 with pulses of elastic vibrations and receives the reflected elastic pulses.

Various defects (longitudinal and transverse cracks of varying sizes, openings of various diameters and shape and so forth) are inscribed on the calibration cylinder 3, and the parts of the cylinder themselves can be made of a material with different acoustic impedance.

Lever 7 is opened and plunger 4 due to the action of its own weight and the weight of cylinder 3 moves into the cavity of cylinder 5, forcing fluid from it (or air) through valve 6. Lever 7 at this time moves into the groove of the upper part of cylinder 5. The rate of fluid or air outflow from the cavity of cylinder 4, and consequently, the movement rate of cylinder 3 in front of the acoustic radiator 10 are regulated by valve 6. A force is applied to lever 7 for the return of plunger 4 to the upper extreme position, with the force being directed upward along the axis of the instrument, as a result of which the calibration cylinder 3 occupies its initial position.

During calibration of equipment with an acoustic system located in the lower end of a subsurface instrument, the calibration device is secured to the subsurface instrument in such a manner that the acoustic system appears opposite the

calibration cylinder 3. In this case the lower part of the device is covered by a cylindrical plug with external diameter equal to the outer diameter of the subsurface instrument.

Advantages of the given device over the existing ones include the possibilities of its use for all kinds of sounding, and also the possibility of regulating the movement speed of a calibration cylinder 3.

CLAIMS

1. Device for calibrating acoustic logging equipment that employs reflected waves, which has a frame, within which is placed the calibration cylinder with defects placed on it characterized in that, in order to expand the functional possibilities of the device, the frame and cylinder are each made of two longitudinally interlinking parts, while each part of the frame has a groove and is equipped with a packing gland.

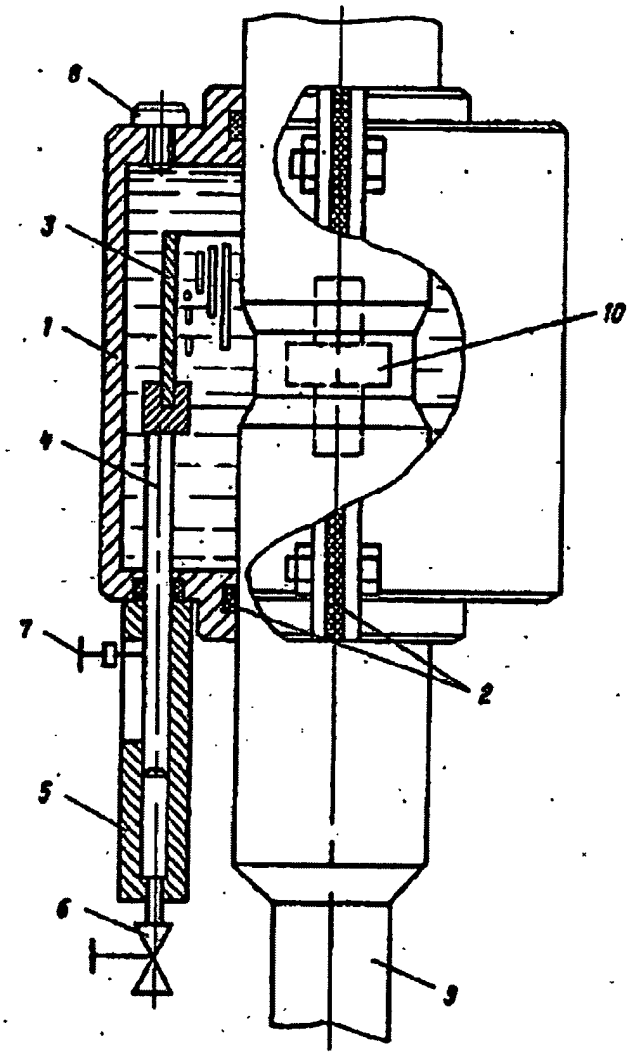
2. Device according to claim 1 characterized in that the cylinder is connected to a controllable brake mechanism.

3. Device according to claim 1 characterized in that the parts of the cylinder are made of materials with different acoustic impedance.

Information sources considered by the examining board:

1. USA patent No. 3,056,464, Cl. 181 - 5, 1962.

2. USSR Author's Certificate No. 551,867, Cl. G 01 V 1/40, 1976.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